

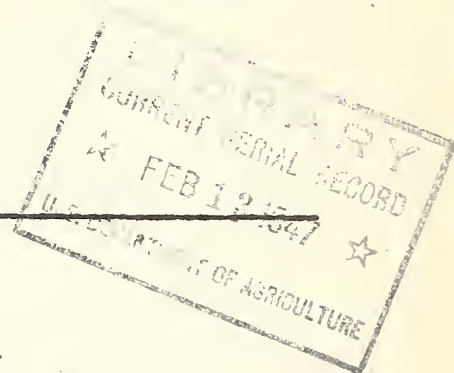
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X SORE HOCKS IN DOMESTIC RABBITS

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INTRODUCTION

Sore hocks, the inflamed or ulcerated areas on the undersurface of the hind feet or on the pad and toes of the forefeet of the rabbit are responsible for considerable loss to the industry. These sore and tender areas cause suffering and loss of flesh, lower the animal's vitality, prevent normal development, prevent does from properly nursing their litters, and shorten the period of usefulness for herd bucks and breeding does. It is a condition that has developed with the domesticated rabbit, for in their natural environment cottontails, jack rabbits, wild hares, and snowshoe rabbits do not develop sore hocks.

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For a considerable period of time a study of the sore hock problem has been under way at the U. S. Rabbit Experiment Station at Fontana, California, to determine, if possible, what factor or factors cause sore hocks, whether or not they are inherited, and methods for treating them.

#### INHERITANCE AND SORE HOCKS

During the period from 1934 to 1943, 26 bucks and 153 does in the main experimental herd were culled because they developed sore hocks, the cause for 9 percent of the replacements. The incidence among the ancestors of these 179 animals is given in Table No. 1.

It will be noted that 19, or 73 percent, of the bucks did not have any ancestors in four generations with sore hocks. The remaining seven bucks had ancestors in one or two generations with sore hocks. The average age at which these 26 bucks were culled because of sore hocks was 16.8 months, the range being from 5 to 36 months.

Eighty, or 52.3 percent of the 153 does that developed sore hocks, did not have any ancestors in four generations that developed this condition. The remaining 73 does had ancestors in from one to four generations with sore hocks.

In dealing with the problem, it would be desirable to know definitely whether this condition is inherited and an experiment was set up to develop information on the subject. The New Zealand breed of rabbits was used in the test with the ancestry of the animals for several generations known.

Some animals that were known to be carriers of the gene for wooly, or long coats, were included in order that the heavy pad factor could be observed, also.

The rabbits were housed in the all-metal hutches equipped with 20 gauge galvanized steel flooring perforated with 5/8 inch square holes, 7/8 inch on center both ways. The 1/4 inch bars that surrounded the 5/8 inch square openings furnished a smooth supporting surface that made up 49 percent of the floor area. The animals were fed a mixture composed of one or more cereal grains and a pelleted soybean meal in which salt had been added in the proportion of one pound of salt to each hundred pounds of meal. Approximately one-tenth pound of green alfalfa was fed each rabbit daily for ten months and green barley was fed during two months of the year. Water and good quality alfalfa hay were available at all times. The young were weaned at 8 weeks and were developed and maintained in separate hutches.

TABLE 1.--Incidence of sore hocks among ancestors of bucks and does similarly affected

Bucks					Does				
Number that developed sore hocks	Number of ancestors with sore hocks				Number that developed sore hocks	Number of ancestors with sore hocks			
	Parents	Grand-parents	Great grand-parents	Great great grand-parents		Parents	Grand-parents	Great grand-parents	Great great grand-parents
19	0	0	0	0	80	0	0	0	0
2	1	0	0	0	11	1	0	0	0
1	1	1	0	0	11	0	1	0	0
1	0	1	0	0	2	0	2	0	0
1	1	0	1	0	10	0	0	1	0
1	0	2	0	0	4	0	1	0	1
1	0	0	1	0	4	0	1	1	0
					1	1	1	1	0
					8	1	0	1	0
					2	1	0	0	1
					1	0	0	1	1
					1	1	2	0	0
					2	1	0	1	1
					2	1	1	0	0
					4	0	1	1	1
					2	1	1	1	1
					1	0	0	2	1
					1	0	0	3	1
					1	0	0	0	3
					1	0	0	2	0
					1	1	3	1	0
					1	0	1	2	1
					1	1	2	0	3
					1	1	1	0	0
Total 26					Total 153				

Inbreeding was practiced to purify the germ plasm and thereby assist in determining whether sore hocks is an inherited character. Eleven inbred litters were developed for the test.

Table No. 2 gives detailed information as to the number of ancestors that had sore hocks, age at which sore hocks developed, and the number of feet involved.



TABLE 2.--Bucks and does in inbred litters: Number of ancestors with sore hocks, age sore hocks developed, and number of feet involved

Litter number	Animal Number	Sex	Number of ancestors with sore hocks				Number of feet with sore hocks	Age animal developed sore hocks	Age sound animals removed from test
			Parents	Grand-parents	Great grand-parents	Great great grand-parents			
6757 $\frac{1}{1}$	L $\frac{2}{3}$ 20	Buck	2	4	2	0	4	Days 196	Days ---
Do. $\frac{1}{1}$	N $\frac{3}{3}$ 350	Doe	2	4	2	0	3	196	---
6843 $\frac{1}{1}$	L 23	Buck	2	4	2	0	2	304	---
Do. $\frac{1}{1}$	N 879	do.	2	4	2	0	3	100	---
Do. $\frac{1}{1}$	N 880	do.	2	4	2	0	4	103	---
Do. $\frac{1}{1}$	N 881	do.	2	4	2	0	4	103	---
6861 $\frac{1}{1}$	N 883	Buck	2	4	2	0	2	298	---
Do. $\frac{1}{1}$	N 884	do.	2	4	2	0	0	---	482
Do. $\frac{1}{1}$	N 410	Doe	2	4	2	0	4	182	---
Do. $\frac{1}{1}$	N 411	do.	2	4	2	0	4	182	---
Do. $\frac{1}{1}$	N 412	do.	2	4	2	0	4	97	---
Do. $\frac{1}{1}$	N 413	do.	2	4	2	0	4	298	---
6892 $\frac{1}{1}$	N 905	Buck	1	4	2	0	1	333	---
Do. $\frac{1}{1}$	N 906	do.	1	4	2	0	0	---	450
Do. $\frac{1}{1}$	N 907	do.	1	4	2	0	2	333	---
Do. $\frac{1}{1}$	N 446	Doe	1	4	2	0	1	266	---
Do. $\frac{1}{1}$	N 447	do.	1	4	2	0	0	---	394
6910 $\frac{4}{4}$	N 921	Buck	2	4	1	0	0	---	437
Do. $\frac{4}{4}$	N 484	Doe	2	4	1	0	1	287	---
6977 $\frac{1}{1}$	N 952	Buck	2	4	2	0	4	205	---
Do. $\frac{1}{1}$	N 955	do.	2	4	2	0	2	205	---
Do. $\frac{1}{1}$	N 531	Doe	2	4	2	0	4	205	---
Do. $\frac{1}{1}$	N 532	do.	2	4	2	0	0	---	389
6997 $\frac{1}{1}$	L 21	Buck	2	4	2	0	2	196	---
Do. $\frac{1}{1}$	N 959	do.	2	4	2	0	1	231	---
Do. $\frac{1}{1}$	N 960	do.	2	4	2	0	4	231	---
Do. $\frac{1}{1}$	N 540	Doe	2	4	2	0	4	206	---
Do. $\frac{1}{1}$	N 541	do.	2	4	2	0	2	206	---
Do. $\frac{1}{1}$	N 542	do.	2	4	2	0	2	221	---
Do. $\frac{1}{1}$	N 543	do.	2	4	2	0	2	305	---
7041 $\frac{4}{4}$	N 978	Buck	2	4	1	0	1	157	---
Do. $\frac{4}{4}$	N 979	do.	2	4	1	0	1	192	---
Do. $\frac{4}{4}$	N 578	Doe	2	4	1	0	0	---	341
Do. $\frac{4}{4}$	L 32	do.	2	4	1	0	1	157	---
Do. $\frac{4}{4}$	N 579	do.	2	4	1	0	0	---	341
7077 $\frac{1}{1}$	N 989	Buck	1	4	2	0	2	199	---
Do. $\frac{1}{1}$	N 990	do.	1	4	2	0	0	---	316
Do. $\frac{1}{1}$	N 603	Doe	1	4	2	0	0	---	316
Do. $\frac{1}{1}$	N 604	do.	1	4	2	0	0	---	316
Do. $\frac{1}{1}$	N 605	do.	1	4	2	0	0	---	316
Do. $\frac{1}{1}$	N 606	do.	1	4	2	0	2	199	---
7207 $\frac{5}{5}$	N 14	Buck	2	4	8	4	1	126	---
Do. $\frac{5}{5}$	L 34	Doe	2	4	8	4	4	178	---
7322 $\frac{5}{5}$	L 27	Doe	2	4	8	4	1	143	---

1/ Sire and dam brother and sister

2/ L - long coated

3/ N - normal coated

4/ Sire and dam half brother and sister

5/ Sire and dam by same sire and grand-dams sisters

Litters Nos. 6757, 6843, 6861, 6892, 6977, 6997, and 7077 resulted from brother and sister matings. The sire and dam of litters Nos. 6910 and 7041 were half brother and sister. The sire and dam of litters Nos. 7207 and 7322 were by the same sire and the grandams were sisters.

Thirty-three of the 44 rabbits, or 75 percent of the 11 inbred litters, developed sore hocks, 14 of the normal-coated bucks when they averaged 201 days of age, the range being from 100 to 333 days, and 13 of the normal-coated does when they averaged 219 days of age, the range being from 97 to 305 days. All six of the long-coated rabbits, L 20, L 21, L 23, L 27, L 32 and L 34, developed sore hocks when they averaged 196 days of age, the range being 143 to 304 days. The pads for L 20 and L 21 were so heavy that it was impossible for the sores to come in contact with the floor.

Only 11 cases, all normal-coated, remained sound until they were removed from the experiment. In the 33 animals that developed sore hocks, no cases occurred earlier than at 97 days of age. This data indicates definitely that sore hocks is not an inherited character for, if so, it would have appeared earlier in the animals' development.

In this test, the predisposing factors for sore hocks were considered to be the type of hutch floor and the moisture retained on it—environmental factors—and the temperament of the animal and density and length of fur on the pad—both inherited characters.

Wild rabbits living on natural solid floors of sod and soil do not develop sore hocks. For the hutch raised rabbit, the nearest approach the breeder can make to this type of floor is a solid one, properly bedded and kept clean and dry. This involves too much labor for the commercial breeder so he has to make a choice between saving labor and having some cases of sore hocks among his rabbits. Wild rabbits develop sore hocks when kept on a hardware cloth for observation. 1/

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1/ Seth Gordon, Executive Director Pennsylvania Game Commission, Harrisburg, Pennsylvania.

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The 5/8 inch mesh, 17 gauge, galvanized hardware cloth usually used for hutch floors and pens has a supporting area of 20 percent. The pressed steel floors used in this experiment had a smooth supporting surface of 49 percent. In the inbred litters, 33 of the 44 rabbits that were maintained on this steel floor developed sore hocks. The 1/4 inch bar that surrounds the 5/8 inch square hole is a distinct disadvantage if the floor is wet. In this test, the moisture that was retained on the floor surface during periods of high humidity, from water spilled in watering the animals, and the urine, kept the floors moist a considerable part of the time. Consequently, the foot pads were moist and caused the padding to become packed—matted in some cases. It formed a sponge-like mass for collecting filth and infection. The moist foot surface became tender and susceptible to bruising which proved to be a predisposing factor for sore hocks. The dense, long fur on the foot pad serves as a protection and renders the foot less susceptible to sore hocks only if it is kept clean and dry.

The more nervous rabbits were easily excited and active. They did a lot of stamping with the rear feet, bruised their hocks and thus were more susceptible to sore hocks than the less nervous animals.



# SIZE OF THE RABBIT'S FOOT AS A FACTOR IN SORE HOCKS

Observations of normal-coated rabbits indicate that the small breeds (Polish, Himalayan, and Dutch) are the least susceptible to sore hocks and the incidence of this malady increases as the mature weights for the breeds increase. The small number of cases among the Angoras is believed to be due to the protection of the heavy foot pad and the large number of cases among the Rex to lack of density and to shortness of fur on the pad.

Nine breeds (Polish, Himalayan, Dutch, Angora, Lynx-Rex, Belgian, Champagne D'Argent, New Zealand, and Flemish), representing the range in mature weight from the lightest to the heaviest breeds, were selected for use in determining what effect the weight supported by a given unit of foot surface (including the hock) may have in causing sore hocks. Mature bucks and does in desirable breeding flesh were included in the study. The Dutch, however, were carrying a little more flesh than the representatives of the other eight breeds.

For measuring the foot surface, the method of procedure was to place the animal in a normal position on a pane of clear glass so the observer could look up at the foot surface silhouetted against bright daylight. The distinct outline of the foot was then traced on the glass with a china-marking pencil and a planimeter was used for determining the square inch foot surface. Detailed information obtained is given in the following table.

TABLE 3—Pounds live weight supported per square inch foot surface.

Breed	Bucks				Does			
	Num-	Ave.	Ave. sq.	Lbs. sup-	Num-	Ave.	Ave. sq.	Lbs. sup-
	ber	live	in. foot	ported by	ber	live	in. foot	ported
	of	wgt.	surface	sq. in.	of	wgt.	surface	by sq. in.
	ani-	lbs.	of 4 ft.	foot	ani-	lbs.	of 4 ft.	foot
	mals		surface	surface	mals		surface	surface
Polish.....	7	2.9	6.88	0.437	5	3.0	6.52	0.454
Himalayan...	2	4.2	10.01	0.417	2	4.0	9.46	0.428
Dutch.....	3	5.2	9.18	0.565	6	5.3	8.68	0.612
Angora.....	5	6.8	10.67	0.640	5	6.6	10.99	0.611
Lynx-Rex....	1	7.0	10.66	0.656	3	6.6	9.95	0.669
Belgian.....	3	7.6	13.89	0.550	5	8.4	13.18	0.640
Champagne								
De Argent..	4	8.7	13.10	0.663	5	9.1	12.42	0.734
New Zealand.	10	10.4	16.41	0.635	15	10.7	15.12	0.708
Flemish.....	6	15.2	24.13	0.632	7	14.8	20.26	0.736

The number of animals involved is sufficient to indicate a trend if there is any relation between the amount of live weight supported by a given area of foot surface and the incidence of sore hocks in breeds with marked differences in weight. By referring to the above table, it will be noted



that there is a progressive increase in weight and in square inch foot surface, ranging from the lightest to the heaviest breeds. The weight supported by a square inch of foot surface is not in direct proportion, however.

More does than bucks were involved in the measurements so this sex is used for the discussion. In the case of the five Polish does, one square inch of foot surface supported an average of 0.454 pounds and for the fifteen New Zealand does, one square inch of foot surface supported an average of 0.708 pounds live weight,—an increase of 55.94 percent. Comparing the five Polish with the seven Flemish does, there is an increase in weight supported by a square inch of foot surface of from 0.454 to 0.736 pounds, or 62.11 percent. This increase of 55.94 percent in weight supported by a square inch of foot surface, ranging from the lightest breed (Polish) to that for the medium weight breed (New Zealand), and the increase of 62.11 percent from the Polish to that of the heaviest breed (Flemish) are significant and indicate that in the case of the heavier breeds the amount of live weight supported by a given area of foot surface is a factor in the development of sore hocks.

In view of the fact that excessive weight is a predisposing cause for sore hocks, it would be well for the breeder to use precaution in developing future breeding stock, not to develop the animals too rapidly or follow a feeding practice that would cause them to put on excessive weight or maintain it over an extended period of time.

#### DISTRIBUTION OF LIVE WEIGHT ON THE FORE- AND HIND FEET AS A FACTOR IN SORE HOCKS

In making the tracings of the foot surfaces for the 94 animals included in the data of Table No. 3, it was noted that if a slight change was made in the posture of the animal the area on which the pressure was diminished became smaller and the area on which the pressure was increased became larger. For the 94 animals included in the above study, the ratio of the forefoot surface to hind foot surface was 1:3 and the distribution of the live weight was in the same ratio.

Sore hocks appear on the hind feet of rabbits and as the sore areas on the rear feet increase and the cases become chronic, the animal changes its posture and throws more weight on the forefeet in an attempt to relieve pressure on these sore and tender areas. When this shifting of weight occurs, the forefeet become involved and sores then develop on the pads and between the toes of the forefeet.

#### TREATING SORE HOCKS

As cases of sore hocks develop, the padding wears off and exposes the skin which becomes irritated. The tissues become bruised. The bare area becomes inflamed, abrasions occur in the skin, the tissues may become infected, and abscesses form. Rabbits suffering from sore hocks raise and lower the affected feet in rapid, successive movements and lie in such position that the tender and sore areas do not come in contact with hard surfaces.

Rabbits that show signs of tenderness in their feet should be examined. If the padding is wearing off or the skin is irritated, the animals should receive prompt attention. Solid-floor hutches should be well-bedded to keep the rabbit dry and clean. A portable self-cleaning lath platform should be placed in hutches equipped with floors of wire mesh or hardware-cloth, so that the animal may rest without the affected feet coming in contact with irritating surfaces. The platform should cover at least half the area of the floor. It may be constructed by placing two pieces of 3/4 by 1-1/2 inch boards on edge to form the ends, making the floor surface of lath, spaced 5/8 inch apart and nailed to the end pieces. The hutch should be thoroughly cleaned, be kept dry and in a sanitary condition.

Sore hocks may be treated quite successfully unless abscesses have formed. Adherent or adjacent matted fur should be clipped off; then the affected areas should be washed with warm soapy water, all loose scabs and debris being carefully removed. The parts should be dried well, and zinc or iodine ointment applied every other day until healing is well under way. Healing will take place more readily if the rabbit is confined in a pen on well-drained clean soil. In such a pen, mild cases of sore hocks will often heal without medical treatment. In the more serious cases, where abscesses have formed, it would be advisable to destroy the animals unless they represent especially valuable blood lines or are to be retained for sentimental reasons. When it is deemed advisable to treat these advanced cases, the affected animals should be isolated in order to help prevent the spread of infection throughout the herd.

The abscesses should be freely lanced, opening them to the bottom of the cavity, to insure proper drainage. Express as much pus as possible and flush out the cavity with any mild disinfectant solution or soapy water. The cavity should then be swabbed, thoroughly but gently, with pledgets of cotton saturated in tincture of iodine. Examine the animals every other day to see that proper drainage is taking place and repeat the treatment as long as pus formation continues. Healing, to be permanent must occur from the bottom of the cavity outward.

Sore hocks will respond to treatment better if the rabbits are fed a properly-balanced ration and are made comfortable. They should not be mated until all inflammation has disappeared and the infected area has healed.

#### SUMMARY

Sore hocks are not inherited but there are certain predisposing factors causing sore hocks which are hereditary and other predisposing factors causing sore hocks which are environmental.

##### Hereditary factors:

Dense and long fur on foot pads. ( A predisposing factor only if not kept dry and clean.)

Nervous temperament that results in increased activity and stamping of rear feet.



### Environmental factors:

Inadequate weight-supporting area of self-cleaning type of hutch and pen floors.

Collection of moisture, urine, and filth on hutch and pen floors.

Increased weight of animal per square inch foot surface.

### Prevention:

Keep floors of hutches and pens clean and dry.

Keep dense and long fur on pads clean and dry in order to protect foot from bruises and resulting sore hocks.

Select breeding stock from individual animals with quiet disposition and protect herd from disturbances by natural enemies—cats, strange dogs, rats, snakes, coyotes, bobcats, opossums, etc.—especially at night.

Do not use feeding methods that develop breeding stock too rapidly or cause the animals to put on excessive weight or maintain the condition over an extended period of time.

### Treatment:

Keep animals on clean, well-drained soil, if possible.

Keep solid floors bedded, dry, and clean.

Use lath platform on wire floor to protect tender and bruised surfaces and keep hutch clean, dry, and in a sanitary condition.

When no abscesses are involved, keep tender or sore area clean and treat with zinc or iodine ointment every other day until healing is well under way.

When abscesses are involved, isolate animals, lance abscesses, express pus, and swab cavity every other day with tincture of iodine, as long as pus formation continues; however, unless they represent especially valuable blood lines or are to be retained for sentimental reasons, the animals with severe cases should be disposed of.



